Structural Investigations of Core-Multishell Nanoparticles – First results from small angle scattering experiments

Christian Rabe 1), Karsten Vogtt 1), Guenter Goerigk 1), Matthias Ballauff 1)
1) Helmholtz-Zentrum Berlin für Materialien und Energie; Hahn Meitner-Platz 1, 14109 Berlin
Emanuel Fleige 2), Rainer Haag 2)
2) Freie Universität Berlin, Institut für Chemie und Biochemie - Organische Chemie, Takustrasse 3, 14195 Berlin

Dendritic core-multishell nanoparticles (CMS) are supposed to be a promising system for drug delivery. A better understanding of their structure and their behavior under certain conditions would help to clarify the mechanism of the non-covalent encapsulation of guest molecules like for example anti cancer drugs.

Liposome-like core-multishell nanotransporters are built up from polar, hyperbranched polyglycerol cores and a double shell structure of linear hydrophobic C_{18}-alkyl chains and hydrophilic monomethyl poly(ethylene glycol) units (Fig. 1) [1]. Due to their chemical structure they are able to be solubilized in polar and non polar media. Furthermore guest molecules of different composition can be encapsulated by this molecule. During this process a formation of supramolecular aggregates can be observed [1]. The particle size for the independent nanocarriers was determined so far by DLS and cryo-TEM to be 8-9nm [1, 2]. For the aggregates sizes of 20-50nm were obtained [1, 2]. The excellent encapsulation properties and the ability to pass the skin barrier easily makes this carrier system a promising tool for drug delivery applications [2, 3].

We like to present the first results from small angle scattering analysis. We combine small angle neutron scattering (SANS) and small angle x-ray scattering (SAXS) with the powerful tool of contrast variation in neutron scattering experiments to clarify the structure in detail. We study the CMS molecules in polar and non-polar environment utilizing respective solvents to analyze structural changes (Fig. 2).

![Fig. 1: Scheme of the chemical structure of dendritic core-multishell nanocarriers](image1)

![Fig. 2: Scattering curves of CMS-nanocarriers in D_2O and CDCl_3 (q=1w %). The error bars of the blue curve are smaller than the symbol size](image2)

References